

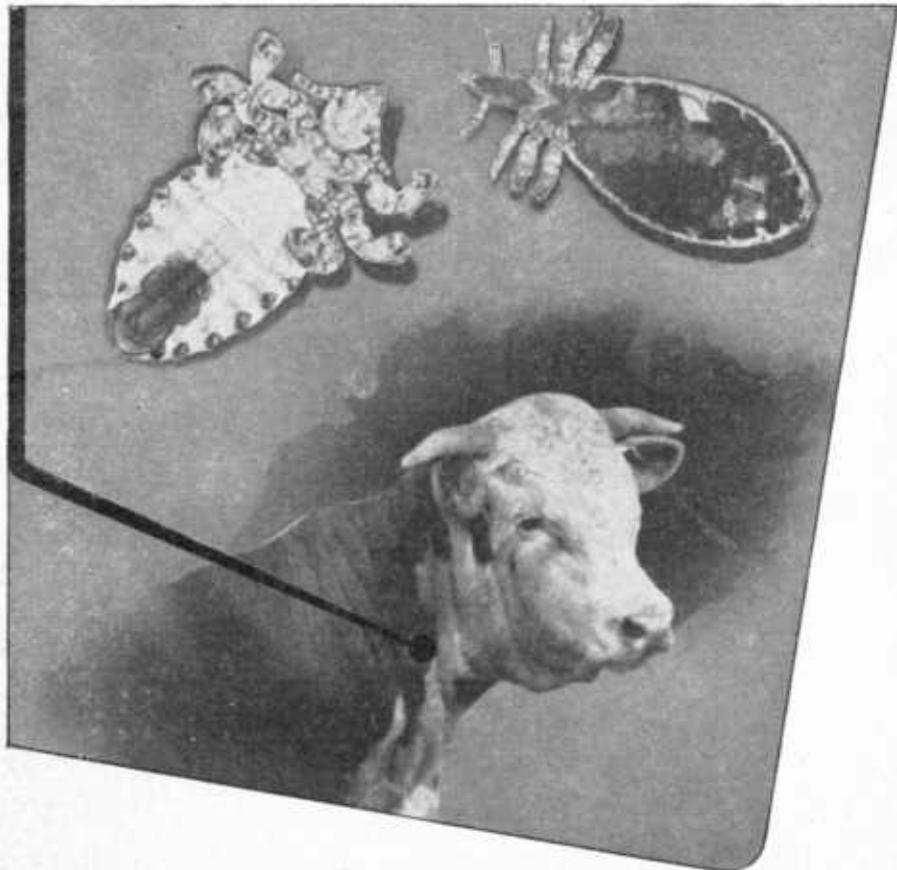
## **Historic, archived document**

Do not assume content reflects current scientific knowledge, policies, or practices.

Ag 84 F  
Copy 4

# Cattle Lice

## and How to Eradicate Them



Farmers' Bulletin No. 909

**U. S. DEPARTMENT OF AGRICULTURE**

Cattle lice are injurious to all classes of cattle, but the greatest losses occur in young stock and poorly nourished old animals. The losses are caused by irritation, digestive disturbances, arrested growth, low vitality, and increased death rate.

Five kinds of lice are commonly found on cattle, and all five species may be present on the same animal at the same time. The same method of treatment may be used for the five species.

Methods of treatment include dipping, spraying, washing, and dusting. Washing and dusting are suitable for treating individual animals and small dairy herds. Dipping is the best method of applying insecticides and should be used whenever practicable. If no dipping vat is available, spraying is the next best method of applying treatment.

Preparations containing arsenic, coal-tar creosote, or nicotine are still widely used as dips. Other insecticides such as pyrethrins, sabadilla seed, and rotenone-containing powders such as derris and cube, are the safest and are being used extensively, especially as sprays, dusts, and washes. The chlorinated hydrocarbon compounds are coming into prominence and are already being widely used as dips and sprays.

Plans of cattle-dipping plants and vats, and directions for using them, are given in this bulletin.

---

Washington, D. C.

Issued February 1918  
Revised May 1953

# Cattle Lice and How to Eradicate Them

By H. E. KEMPER,<sup>1</sup> Veterinarian, and HAROLD O. PETERSON, Parasitologist,  
Zoological Division, Bureau of Animal Industry,  
Agricultural Research Administration

## CONTENTS

	Page		Page
Distribution and economic importance	1	Dips	10
Blood-sucking lice	2	Rotenone dips	10
Biting lice	4	Chlorinated hydrocarbon dips	10
Nature and habits	5	Arsenical dips	11
Methods of treatment	6	Coal-tar creosote dips	11
Dusting	6	Nicotine dips	12
Washing	7	Directions for dipping	12
Spraying	7	Dipping plants	14
Dipping	9	Selecting a location	17
		Corrals and chutes	17
		Draining pens	18
		Vats	18

## Distribution and Economic Importance

Cattle lice have been recognized as a pest by livestock growers since early times. They are found on cattle in all parts of the United States, especially where cattle are held in large herds or in badly kept and poorly ventilated stables. Western range cattle often become heavily infested with lice, the degree of infestation varying from year to year with climatic and other conditions. In farming communities the parasites usually are most prevalent on underfed and poorly housed cattle, although they may occur on animals in good flesh and kept in sanitary quarters.

Lice on cattle may not be observed until they become very numerous and cause unmistakable annoyance. These parasites are first noticed among the poor, weak, unthrifty members of the herd, and the owner frequently assumes that they are lousy because they are unthrifty, whereas their unthriftiness may be caused by the lice. Individual members of a herd are not usually

affected equally, as some cattle seem to be unsuitable hosts to such an extent that they may be considered practically immune. However, when lice are introduced into a herd during the fall or winter they usually spread rapidly until many animals are infested.

The irritation caused by the parasites is evidenced by the efforts of animals to obtain relief by rubbing and scratching. Some of the animals in grossly infested herds have large areas of skin that are partly denuded of hair and are raw and bruised from rubbing against posts and other objects. The lowering of the vitality of animals affected with lice and the general unthrifty condition produced by these parasites often result in an increased percentage of deaths among cattle during unfavorable seasons.

Calves, young stock, and old, weak, poorly nourished cattle suffer most from the ravages of lice. Heavily infested calves do not grow

<sup>1</sup> Revision of former editions by Marion Imes (retired).

and thrive or gain weight normally during the winter and often remain stunted until spring, when most of the lice are shed with the old hair coat. The animals then grow and fatten, but the loss during the period of arrested growth is not easily regained. Lice contribute to the death rate among poorly nourished cattle of low vitality, especially old range cows exposed to inclement weather. Mature cattle in full vigor suffer less from infestation with lice; nevertheless if they become very lousy they will not gain weight and there will be a loss in the production of either meat or milk. Very extensive infestations of blood-sucking lice may develop on some individuals in a herd, producing a pronounced anemia.

Lice extract red blood cells and reduce them by as much as three-fourths of the normal number. Laboratory tests show that there is a direct relationship between the extent of lousiness in cattle and the degree of anemia in infested animals. The loss of red blood cells results in extreme weakness; the animals are unable to withstand unfavorable weather conditions or undue exercise, and they usually die. The losses caused by lice are of sufficient importance to warrant careful consideration and treatment.

Five species of lice are found on cattle in the United States. Four of these are blood-sucking lice, and are commonly known as "blue lice." The other species is a biting louse commonly known as the "red louse."

### Blood-Sucking Lice

The short-nosed cattle louse (*Haematopinus eurysternus*, fig. 1) is usually found on mature cattle, although it may occur on calves and young stock. The average length of adult females is about one-eighth of an inch and the body is about half

as broad as long. The males are slightly smaller than the females. The head is short, nearly as broad as long, and bluntly rounded in front. The head and thorax are yellowish brown, while the abdomen is slate blue.

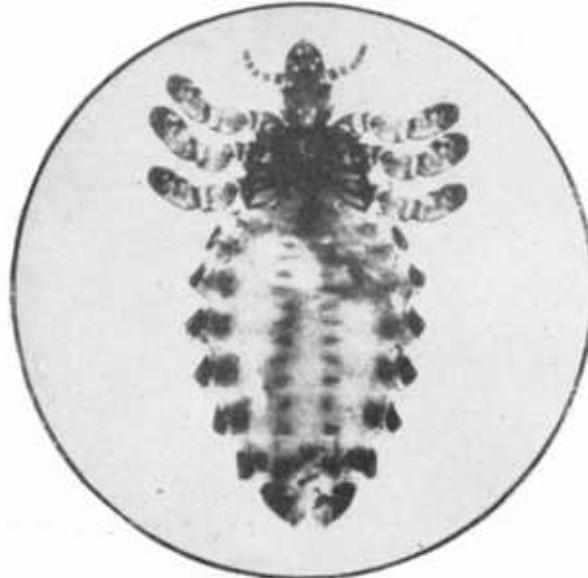


Figure 1.—Short-nosed cattle louse (*Haematopinus eurysternus*), female. (Magnified about 20 times.)

These lice pass the various stages of their life cycle on the animal. The eggs, commonly called nits, are attached firmly to the hairs, close to the skin, and they hatch on the animal in 11 to 18 days, the average period of incubation during mild weather being about 14 days. The young females begin to lay eggs when they are about 12 days old.

The long-nosed cattle louse (*Linognathus vituli*, fig. 2) is usually

and is probably more common than heretofore supposed. With careful observation this species may be distinguished by its head, which is short and broadly rounded in front, and by the prominent abdominal tubercles bearing the spiracles.

These lice pass their entire life cycle on the animal and deposit eggs in the same general manner as the other species. The eggs hatch in 10 to 14 days, the average period

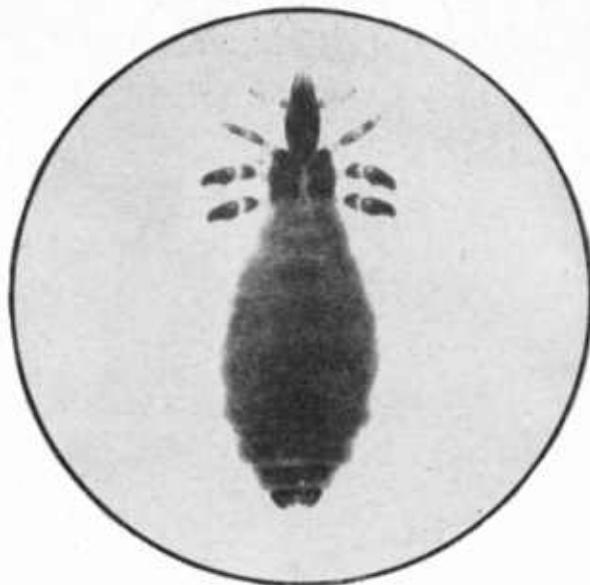


Figure 2.—Lang-nosed cattle louse (*Linognathus vituli*), female. (Magnified about 20 times.)

found on calves and young stock, but sometimes occurs on mature cattle. The adult lice have about the same general color as the short-nosed lice; the two species can, however, be distinguished easily. As implied by the term "long-nosed," the head is long and slender, and the body is only about one-third as broad as long, giving the entire body a more slender appearance than the short-nosed species.

The "small blue louse," or "capillate louse," (*Solenopotes capillatus*, fig. 3) is not easily distinguished from and is often confused with the common long-nosed species. It is shorter than the long-nosed species

of incubation being about 12 days. The females reach sexual maturity and begin laying eggs about 11 days from the date of hatching.

*Haematopinus quadripertitus* has been found infesting cattle in Puerto Rico, and more recently in Florida and Texas. It is called the tail louse because it is commonly found in the long hair forming the tail switch. It is also found around the eyes, on certain parts of the neck, and other body areas. Cattle in the East Indies, South America, Guam, and Australia are frequently infested with this parasite. The louse resembles *Haematopinus erysterus*, but can be distinguished by

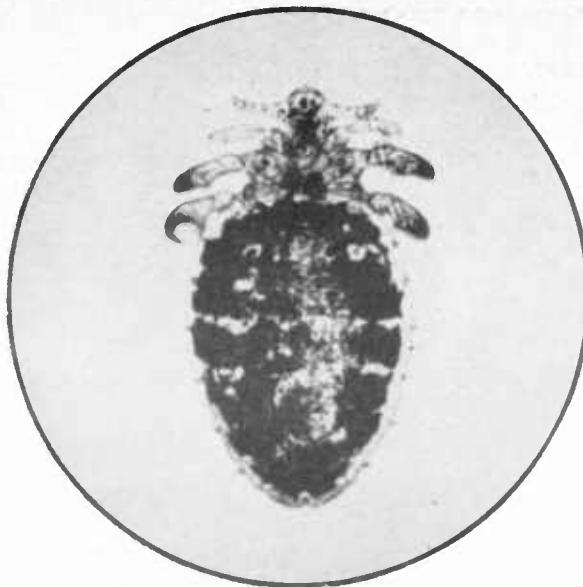


Figure 3.—Small blue louse (*Solenopotes capillatus*), female. (Magnified about 36 times.)

its somewhat larger size and the number of hairs, usually 5 or 6, and sometimes 8 or more, at the margin of the abdominal segments. The

adult female usually lays its eggs in the long hair of the tail switch. Its life cycle is believed to be similar to that of *Haematopinus eurysternus*.

### Biting Lice

The common biting lice of cattle (*Bovicola bovis*, fig. 4) are found on both young and mature cattle. They are much smaller than sick-

ing lice, but are visible to the naked eye. The head is broad and blunt, the color is reddish, that of the body commonly yellowish white. They

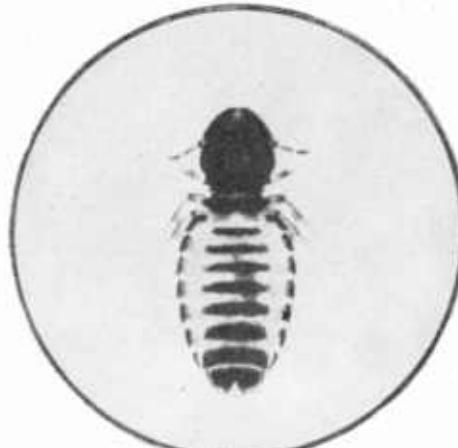


Figure 4.—Biting louse of cattle (*Bovicola bovis*), female. (Magnified about 20 times.)

may be distinguished readily from the sucking species by the general shape of the head and body, and by the color.

The life history is similar to that of the sucking lice. The average period of incubation is probably about 10 days.

## Nature and Habits

Each species of domestic animal has its own particular species of lice, and except in accidental cases cattle lice are found only on cattle. These lice increase rapidly in number on cattle during dry, cold weather when the hair coat is long. When green feed comes in the spring the animals shed the old coat of hair and with it most of the eggs and many of the lice. The lice seem to disappear, and are rarely seen during the summer. The few remaining lice increase slowly and are usually not detrimental while the animals are on green feed and in a thriving condition. Individual animals that are carriers may have large numbers of lice even during the summer. With the coming of winter, the lice increase rapidly. Treatment should be applied in the fall while the weather is suitable and before the lice have become numerous enough to cause injury.

Sucking lice usually select locations where they are partly protected from the efforts of the animals to dislodge them. The favorite locations are the sides of the neck, brisket, back, inner surface of the thighs, tail, and the head around the nose, eyes, and ears. Short-nosed cattle lice frequently colonize around the eyes and muzzle, giving the areas a smudged appearance, especially on white-faced cattle. When animals are very lousy the entire surface of the body may become involved. The adult tail louse primarily localizes in the long hairs of the tail switch. The sucking lice obtain food by puncturing the skin of the host and feeding on the blood and lymph. When not feeding, they move about over the hair and skin.

Biting lice usually are found on the withers and around the root of the tail, but they may occur on any part of the body. They feed on particles of hair, scales, and excretions from the skin. They do not irritate the animals as much as sucking lice. When present in large numbers they often form colonies or groups around the base of the tail, over the withers, and on other areas of the body. The irritation is intense, and the attempts of the animal to relieve the annoyance by rubbing and licking produces raw skin wounds. The wounds vary in size from that of a 25-cent piece to 4 or 5 inches in diameter. They may resemble mange or ringworm, but careful examination reveals lice. The skin is more soft and pliable, and not so hard and thick as in mange.

When separated from their hosts, biting lice live about 7 days, sucking lice only about 4 days. Their eggs are deposited on the host, but when the hair to which they are attached is removed and kept under laboratory conditions, they may continue to hatch for as long as 20 days. The newly hatched lice live only 2 or 3 days unless they find a host.

The longevity of the lice and the viability of their eggs when separated from the host have an important bearing on eradication. The parasites and eggs may become dislodged from the animals, drop in the corrals, stables, and pastures, and temporarily infest the premises. It seems reasonably certain that all lice that remain off the animals, even under the most favorable conditions, die within 7 or 8 days, and

if the weather is cold and conditions unsuitable they die in less time.

When louse-infested cattle are treated with chlorinated hydrocarbon insecticides such as lindane, BHC, DDT, chlordane, and toxaphene, it is usually not necessary to disinfect the stables, corrals, or sheds. These insecticides retain their effectiveness on treated animals for several days, and the few lice that get on cattle from infested premises are destroyed by the insecticide remaining on the treated animals. However, if cattle are treated with other than chlorinated hydrocarbon insecticides, the premises should be cleaned and disinfected with a good disinfectant. Coal-tar creosote dips, diluted in

accordance with the instructions on the container, are suitable for this purpose.

The several species of lice differ somewhat in their susceptibilities to insecticides. The arsenical dip, for example, is not reliable for eradication of the short-nosed louse, and sodium fluoride dusting powder is destructive only to biting lice. Moreover, DDT is more toxic to the short-nosed louse than to the common long-nosed species. There is evidence likewise that the 1-percent fixed-nicotine dusting powder is particularly destructive to the small blue louse, although probably not sufficiently efficacious against other species to warrant wide general use.

## **Methods of Treatment**

There are four methods of treating cattle infested with lice—dipping, spraying, washing, and dusting. The choice of treatment depends upon the number of cattle to be treated, the insecticide used, the weather conditions, and the available facilities. Dipping is the best method. Where the winters are mild, cattle can be dipped without injury from cold. In some northern areas it is usually too cold for dipping, but the animals can be sprayed or washed if kept inside the barns.

Treatment by dusting and washing is practical only when a few animals are to be treated or to control infestations during the winter, when it is too cold for other methods. Treatment for lice in the spring and fall is good insurance against losses and the necessity of expensive winter treatment. All animals in the herd should be treated regardless of the number infested. If only part of the herd is treated the lice will spread by contact from the untreated animals and the herd will become reinfested.

### **Dusting**

The effectiveness of dusting powders depends upon their content of derris or cube powder, sabadilla seed, nicotine, pyrethrum, naphthalene, or the chlorinated hydrocarbon insecticides such as DDT, BHC, lindane, chlordane, or toxaphene. They are especially useful in combating infestations in small herds and for holding lice in check when the weather is too cold for wet treatments. Properly prepared powders containing derris or cube powder (of 5-percent rotenone content), sabadilla seed, or the chlorinated hydrocarbons are generally regarded as the most useful because they destroy all species of lice and can usually be relied upon to protect cattle from serious reinfestations for at least 3 or 4 weeks. They are also easy to prepare and use. Suitable dusting powders containing these substances may be made by mixing thoroughly 1 part by weight of the active ingredient (which must be finely ground) with from 9 to 10 parts of wettable sulfur

of 325 mesh fineness. Other suitable vehicles or diluents, such as talc, kaolin, and pyrophyllite (Pyrax ABB) may be used with equal efficacy.

The mixture must be well rubbed in all over the animal, and ordinarily 3 to 6 ounces is sufficient for a single application. Dusting powders containing BHC and lindane, and to a lesser extent toxaphene and chlordane, will destroy some of the nits. They can all be depended upon to destroy motile lice, but more than one treatment is required to eradicate the infestation.

### **Washing**

The most dependable insecticides for use as washes are derris powder and the chlorinated hydrocarbon insecticides such as DDT, lindane, BHC, toxaphene, and chlordane. Any of the insecticides in concentrations recommended for dipping can also be used as washes.

Derris-powder wash, a safe and dependable remedy, should be prepared just before use. It is made by dissolving soap flakes in warm water in the proportion of 2 to 4 ounces of soap to each gallon of water; derris powder containing 4 or 5 percent of rotenone is then added to the soapy water in the proportion of 12 ounces of derris powder to each gallon of soap mixture. When the mixture is well stirred, it is ready to use.

Aqueous suspensions containing approximately 0.5 percent of DDT are also widely used. The simplest way to make a suspension of this kind is to mix thoroughly with water the required amount of a commercial wettable DDT powder or stock emulsion. Four ounces of 50-percent wettable DDT powder in 3 gallons of water is a useful formulation. Preparations containing DDT in kerosene or other solvents should not be applied to animals; the only exceptions to this are a few

concentrated stock emulsions or solutions that are specifically designed for livestock use after dilution with large amounts of water.

Washes prepared from BHC and lindane should have a gamma isomer concentration of 0.06 percent. If wettable BHC containing 10 percent gamma isomer is used, 0.06 percent concentration can be obtained by adding 2½ ounces of powder to 3 gallons of water. If wettable lindane powder is used, add 1 ounce of powder to 3 gallons of water. Washes prepared from wettable toxaphene and wettable chlordane should have a concentration of 0.5 percent. This concentration can be obtained by mixing 5 ounces of toxaphene or 5 ounces of chlordane with 3 gallons of water. The addition of an ounce of soap to the water makes the wash easier to apply.

These washes are suitable for use during any season of the year except in extremely cold weather. Apply them with a brush or a cloth, spreading a thin, even coating over the surface of the head and body, including the inner surface of the ears and between the thighs.

### **Spraying**

With improvement and development of spraying equipment (figs. 5, 6, 7) spraying has come to be a convenient and effective method for destroying cattle lice. It is not as effective as dipping, but if animals are thoroughly and carefully sprayed, lice can be eradicated. Two sprayings 15 to 16 days apart may be required to insure effective eradication. Hand-operated pumps can be used to treat a few individual animals. Motor-driven, high-pressure pumps mounted on vehicles are more satisfactory in treating large herds. All types of power sprayers should be equipped with an agitator to keep the insecticides evenly suspended. Where



Figure 5.—A small wheelbarrow-type power sprayer.

orchard spraying equipment is available, it may be used for spraying animals.

The quantity of spray used per animal will depend on the size of the animal as well as the rate of delivery by the pump, the distance of the operator from the animal, and other factors. In northern sections of the country where animals have a long dense hair coat, from 3 to 5 gallons of spray under pump pressure of from 200 to 300 pounds is required to wet a mature animal thoroughly. Animals with short hair, such as Brahmas, do not require so much. The spray gun should be opened enough to form a spray pattern about 6 inches wide. It is important that the entire sur-

face of the animal's body receive the maximum possible wetting, special attention being given to the head, ears, brisket, tail, and inner surfaces of the elbows, flanks, and thighs.

A safe and dependable spray can be prepared by mixing 1 pound of cube powder containing 5-percent rotenone, 10 pounds of wettable sulfur, and 100 gallons of water. The wettable sulfur may be omitted, and in that event, 2 pounds of derris or cube powder should be used for each 100 gallons of water.

The chlorinated hydrocarbons are manufactured as wettable powders or water-emulsifiable concentrates. The wettable powders have proved satisfactory as sprays for cattle lice. Some chlorinated hydrocarbon insecticides formulated as emulsifiable concentrates may be more toxic than wettable powders, and the oil and solvents in them may prove irritating under certain circumstances.

DDT is formulated as wettable 50-percent powder. As a spray for lice it should be used at a concentration of 0.5 percent. This concentration is obtained by mixing 8.3 pounds of powder to each 100 gallons of water. Toxaphene and chlordane are produced as wettable 40-percent powders and are also used at a 0.5-percent concentration, and 10 pounds of powder is required for each 100 gallons of water. Spray formulations made from lindane and BHC are based on the content of gamma isomer in each of these products. Lindane formulations contain 25-percent gamma isomer, and BHC contains 6-, 10-, or 12-percent gamma isomer. The recommended concentration for the destruction of cattle lice with these insecticides is 0.03- to 0.06-percent gamma isomer. One pound of a 25-percent lindane formulation for each 100 gallons of water makes a spray having 0.03-percent concentration. Two pounds of this pow-

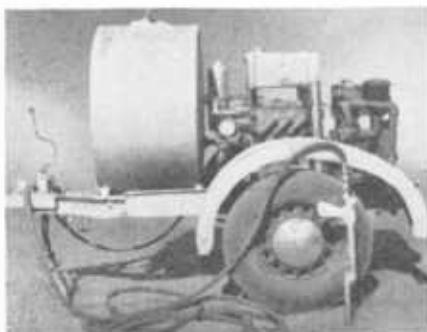


Figure 6.—A small power-driven sprayer mounted on two wheels with trailer hitch attached.

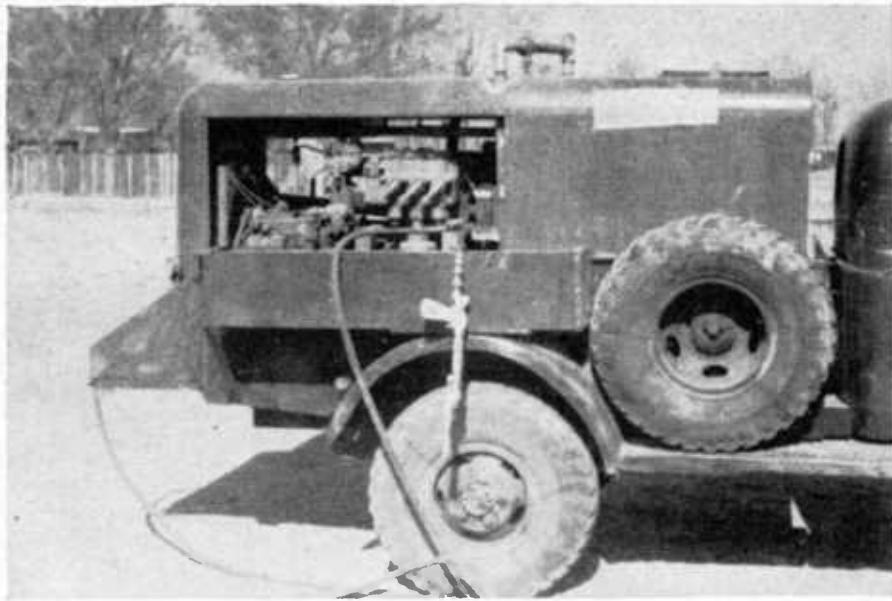


Figure 7.—A large power-driven sprayer mounted on a truck.

der in 100 gallons of water makes a spray having 0.06 percent.

Four pounds of BHC containing 6-percent gamma isomer in 100 gallons of water makes a spray having a gamma isomer concentration of 0.03 percent. When using the 10-percent product  $2\frac{1}{2}$  pounds are required and when using the 12-percent product, 2 pounds per 100 gallons of water are needed. To make a 0.06-percent concentration the above quantities should be doubled, namely, 8 pounds per 100 gallons of water for 6-percent product, 5 pounds for the 10-percent product, and 4 pounds per 100 gallons for the 12-percent product.

The tail louse is somewhat more difficult to destroy than other species of lice. Use a higher concentration of insecticide. To control this louse on beef cattle, treat the entire animal with a spray containing 1.0 to 1.5 percent of DDT. For dairy cattle, the same concentration of methoxychlor should be used. If 50-percent wettable DDT or methoxychlor is used, 25 pounds of

powder per 100 gallons of water are required to make a 1.5-percent spray; 16 pounds per 100 gallons is required for a 1-percent spray.

### Dipping

Dipping consists in immersing animals in a medicated liquid that will kill the lice. It is the most successful known method of applying treatment for lice. Dipping plants are usually arranged so that the cattle enter one end of a vat filled with dip, swim through, and leave the vat at the opposite end.

One dipping sometimes eradicates the lice, but it cannot be depended upon to do so at all times. The first dipping, if properly done, may kill all the lice or cause them to leave the animals, but it may not destroy all the eggs. Some of the eggs often survive the first dipping and hatch, thus forming a new generation of lice. This new generation should be destroyed by a second dipping before they have had time to develop to maturity and deposit

their eggs. The second dipping should be delayed long enough to give the eggs laid before the first dipping sufficient time to hatch; otherwise they may hatch after the second dipping and reinfest the cattle. Because of variations in the incubation period and the period required for lice to reach maturity it

does not seem possible to meet both of these conditions in establishing the length of the interval between dippings, but a period of 15 to 16 days has generally given satisfactory results. When conditions are such that an infested herd cannot be dipped twice, one dipping will amply repay the cost of the effort.

## Dips

### **Rotenone Dips**

One of the best treatments for destroying cattle lice is the 10-100-1,000 cube-sulfur or derris-sulfur dip. This is made according to the following formula: 10 pounds of either derris or cube powder (finely ground, and containing from 4.4 to 6.4 percent of rotenone), 100 pounds of wettable sulfur (325 mesh or finer), and 1,000 gallons of water. First, put the water into the vat. Mix the required amount of derris or cube powder with some of the sulfur, and stir into the water. Then add the rest of the sulfur. The vat should be cleaned and recharged after heavy use, and the suspension should be regarded as of doubtful value after standing as long as a week, particularly if the medium is alkaline.

Although this formula is widely used, the precise advantages of the sulfur component are rather obscure. Some investigators and some stockmen omit the sulfur entirely. There is evidence, however, that the sulfur assists in preparing and maintaining an even suspension of the rotenone-containing powder and that it increases the time the dip remains effective.

### **Chlorinated Hydrocarbon Dips**

DDT is the only one of the chlorinated hydrocarbon insecticides that has been extensively used as a dip. Lindane, BHC, toxaphene, and chlordane have not been tested enough under field conditions to

warrant their general recommendation for use as dips. Relatively weak concentrations of DDT have controlled the short-nosed louse and biting lice, although, in some instances, the long-nosed sucking louse has proved to be resistant to it. Suspensions containing from 0.25 to 0.50 percent of DDT have completely eradicated all kinds of lice with a single dipping. The simplest formula calls for 40 to 80 pounds of commercial wettable DDT powder mixed with 1,000 gallons of water. As many kinds of DDT preparations are available commercially, be sure to select a product developed specifically as a dip for livestock and follow carefully the instructions given for preparing a dip of the desired strength.

**CAUTION.—DDT, BHC, toxaphene, and chlordane should not be used as dusts, washes, sprays, or dips on producing dairy cattle, nor on beef cattle for at least 30 days prior to slaughter for human consumption. Small quantities of these insecticides are absorbed through the skin and deposited in the tissues of the treated animals. They are eliminated partly through the milk. There is a potential danger therefore in consuming milk and meat from cattle recently treated with the insecticides. Thirty days after treatment, some of the insecticides would be entirely eliminated from the animal body, and others, such as DDT, would be materially reduced in quantity.**

**Rotenone and chlorinated hydrocarbon insecticides are poisonous to fish. Therefore, in disposing of unused dusts, washes, sprays, and dips containing these chemicals, take care not to pollute streams. Moreover, do not allow pools of spray material to form from which animals may drink, or let the material drain over vegetation upon which live-stock are permitted to graze.**

### **Arsenical Dips**

Arsenical dips have been used to a considerable extent for lice and have proved to be very satisfactory. Several brands of prepared arsenical dips permitted by the Government for use in dipping cattle with southern fever ticks, are suitable also for dipping cattle affected with lice.

**In using arsenical dip, remember that arsenic is a poison, and that due precaution should be taken to avoid injury.**

**With proper care, arsenical dip is a safe and efficacious remedy. Care should be taken not to expose the hands or other parts of the body more than necessary to the action of the dip. Wash the hands frequently and do not get the clothing wet with the dip.**

**Do not allow animals to drain where pools can form from which they may drink, or to drip on feed in lots or on pastures contaminating the feed, since this may result in death losses.**

Arsenical dip left in the vat may be used again if it is not filthy. When not in use, the vat should be covered or enclosed by a fence so that animals may not have access to it. In cleaning the vat the contents should not be emptied or allowed to flow into streams or on land or vegetation to which animals have access. The best plan is to run the dip into a pit or trench protected by a fence. The trench should be located so the dip will not be carried by seep-

age into the water supply of the farm or the neighborhood.

The temperature of the dip should range between 65° and 90° F.

### **Coal-tar Creosote dips**

Coal-tar creosote dips are sold under many trade names. They are made from coal-tar derivatives and the principal ingredient is creosote oil, which is made soluble in or miscible with water by means of soap. When diluted with soft water they are efficacious in eradicating cattle lice. Before using them with hard or alkaline water, the following test should be made to learn whether a separation occurs in such water: In a clean bottle or jar of clear glass, place a measured quantity of dip and pour in, with thorough mixing, the desired quantity of water, preferably warm, which should be added in approximately the proportion to be used in dipping. If after standing for an hour an oily layer or mass of globules appears either at the top or at the bottom of the liquid, the dip should not be used with that kind of water. This simple test for the coal-tar creosote dips may often prevent loss. There is no field test for determining the deterioration of these dips, consequently in replenishing the dip the percentage of active ingredients in the vat is largely a matter of guesswork. Coal-tar creosote dips may be used cold or warm, but the temperature of the bath should not exceed 95° F.

When diluted ready for use, these dips should contain not less than 1 percent by weight of coal-tar oils and cresylic acid. In no case should the diluted dip contain more than four-tenths of 1 percent nor less than one-tenth of 1 percent of cresylic acid. When the proportion of cresylic acid falls below one-tenth of 1 percent, it should be increased sufficiently to bring the total of the cresylic acid in the diluted

dip up to four-tenths of 1 percent by weight.

In the undiluted coal-tar creosote dips, especially in cold weather, the naphthalene and other constituents may separate. Hence, care should be taken to see that the dip is homogeneous in character before using any portion of it.

Follow the instructions on the label of the container.

### Nicotine Dips

Nicotine dips are sold under various trade names. Farmers and livestock growers are more or less familiar with them as insecticides for plant pests and dip for livestock. They are efficacious in eradicating cattle lice when used in concentrations of five one-hundredths of 1 percent of nicotine. If much stronger than 0.05 percent they are liable to injure cattle, but if properly used they cause no

injury. Never dip cattle while they are hot. A field test has been designed by a manufacturer of nicotine in the dipping bath may be ascertained at any time. Nicotine dips by which the percentage dips should be used in accordance with the instructions on the container. Do not use any preparation the strength of which is not given on the label.

Nicotine dips are generally used warm, but should not be heated above 105° F. The temperature of the dip for lice should be maintained at 95° to 100° F.

Sulfur is sometimes added to nicotine dips in the proportion of 16 pounds flowers of sulfur to 100 gallons of diluted dip. Very little sulfur is dissolved in the dip but part of the undissolved portion is deposited on the skin of the animal, where it remains for a long time, thus tending to prevent reinfection.

### Directions for Dipping

If dipping is to be successful it is necessary to give close attention to details and see that the work is performed carefully and thoroughly. Water and feed the cattle before bringing them to the vat so that they will not be hungry or thirsty at the time of dipping. They should not, however, be gorged with feed and water when they are dipped. If they are watered and fed 2 to 4 hours before dipping, they are likely to be in the best condition for the operation. When cattle have been driven and are hot at the time of reaching the vat, allow them to cool off as it is dangerous to dip animals while they are hot. When the nights are cold, dipping should be finished for the day early enough for the animals to become dry before sunset.

During dipping operations the vat contents should be maintained at a depth of 70 to 80 inches, or of sufficient depth to swim the tallest

animal. Ascertain the quantity of dip necessary before starting to prepare it. The average 1,000-pound short-haired steer will carry out and retain about 2 quarts of dip, and the same class of cattle with long hair will retain about 1 gallon. The total estimated amount of dip that the animals carry out and retain, plus the amount required to charge the vat, should equal the total amount required, if none is lost by leakage or otherwise wasted.

In determining the vat capacity, measure only the space to be filled with liquid. Multiply the average length by the average width in inches, then the product by the depth; this will give the approximate number of cubic inches of space to be filled with dip. Divide this by 231 (the number of cubic inches in a gallon), and the result will be the approximate number of gallons of dip required to charge the vat.

To obtain the average length, add the length at the bottom to the length at the top (that is, at the line to which the vat is to be filled), and divide this sum by 2. Obtain the average width in the same manner. The depth should be taken at the center of the vat, and should be from bottom to dip line only and not to the top of the vat. The capacities of the various tanks are obtained by a like process. Gages or rods should be prepared and marked to show the number of gallons at various depths in the vat and tanks.

After the vat is filled to the required depth, stir the contents thoroughly to insure uniform strength throughout. A good method is to fasten a rope to a pail, allow it to sink, then drag it rapidly from one end of the vat to the other, repeating the operation several times. Stirring plungers (fig. 8) are also useful implements, and as they are easily made, one or more should be provided at every vat. Their use is similar to that of the dasher of an old-fashioned hand

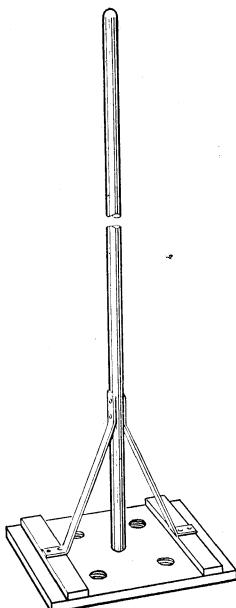


Figure 8.—Stirring plunger for mixing liquids in the vat.

churn. The plunger is pushed to the bottom of the vat and raised rapidly, the process being repeated as the operator moves slowly along the vat.

Before beginning dipping operations examine the pens, chutes, slide board, vat, etc., for projecting nails, broken boards, or any object that may puncture or wound the cattle, as the dip may injure those having fresh wounds. The animals should be handled as carefully as possible, although attendants can exercise very little control in dipping wild range cattle. Range cattle, not accustomed to being handled, are easier to dip than tame farm animals, as they go through the chutes and enter the vat more readily. If the animals start running through the chute, restrain them to prevent their piling up and drowning in the vat. At large dipping plants a gate is usually provided in the chute near the entrance to the vat to hold the animals and allow them to pass only as room is made for them. If the chute has no gate, a bar which can be slipped across the chute between the side boards will answer the purpose. Gentle farm animals, and especially old milk cows, usually do not enter the vat readily—in fact, it is often necessary to push them on the slide board.

In dipping cattle for lice it is not necessary to hold them in the vat, but they should be completely submerged and the head ducked at least once. When the heads are ducked the air enclosed in the ears may prevent the dip from wetting the inner surfaces of the ears or coming in contact with lice in the lower folds. Make sure that the dip enters the ears of each animal as it passes through the vat. This may be accomplished by pushing the heads so low in the dip that the liquid fills the ears or by splashing the dip with an old broom over and into the ears.

Men with dipping forks should be stationed along the vat to duck the heads of the animals and render assistance in case any of them become strangled. Dipping forks (fig. 9) may be bought ready-made or may be made to order by a blacksmith.

After the cattle leave the vat, hold them in draining pens or corrals until all surplus dip has drained off them. They should not be driven long distances or moved rapidly within 24 hours or even longer after dipping, as injury may result from too much exercise or overheating shortly after dipping, especially if arsenical dip or oil is used.

Change the dip as soon as it becomes filthy, regardless of the number of animals that have been dipped in it. In cleaning the vat remove the entire contents, including all sediment and foreign matter.

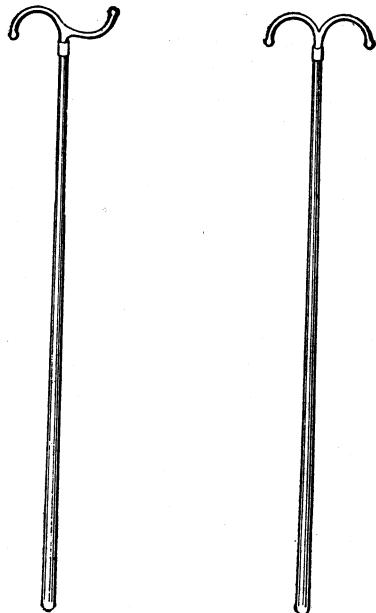


Figure 9.—Two styles of cattle-dipping forks.

### Dipping Plants

The farmer who has only a small number of animals to dip may use a

community where there are a number of farmers who want to dip their cat-

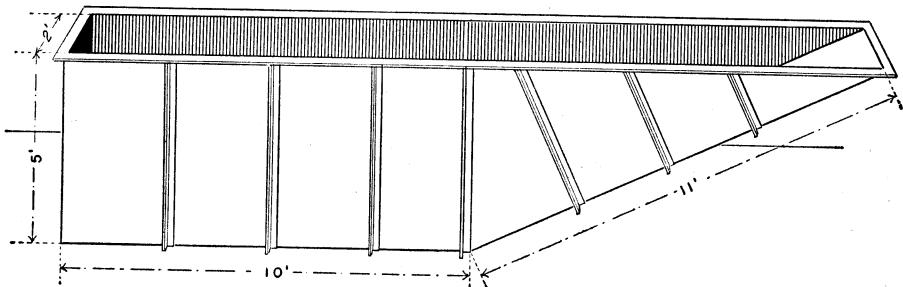


Figure 10.—Portable galvanized metal dipping vat.

portable galvanized metal vat (fig. 10). These vats may be purchased ready-made, and they answer the purpose very well for dipping small lots of light- or medium-weight cattle. After digging a trench and setting the vat with the top flush with the surface of the ground, provide a chute and a slide board as a means of getting the animals into the vat.

A permanent dipping plant is much more satisfactory. In a com-

tle, a fund for building a community dipping plant may be obtained by getting each farmer to contribute in proportion to the number of cattle he owns. In designing or selecting a plan for a dipping plant, remember that the vat should be so constructed as to be suitable for use in dipping for scab as well as for lice and other parasites.

Two styles of dipping plants are shown in the plans (figs. 11 and 12).

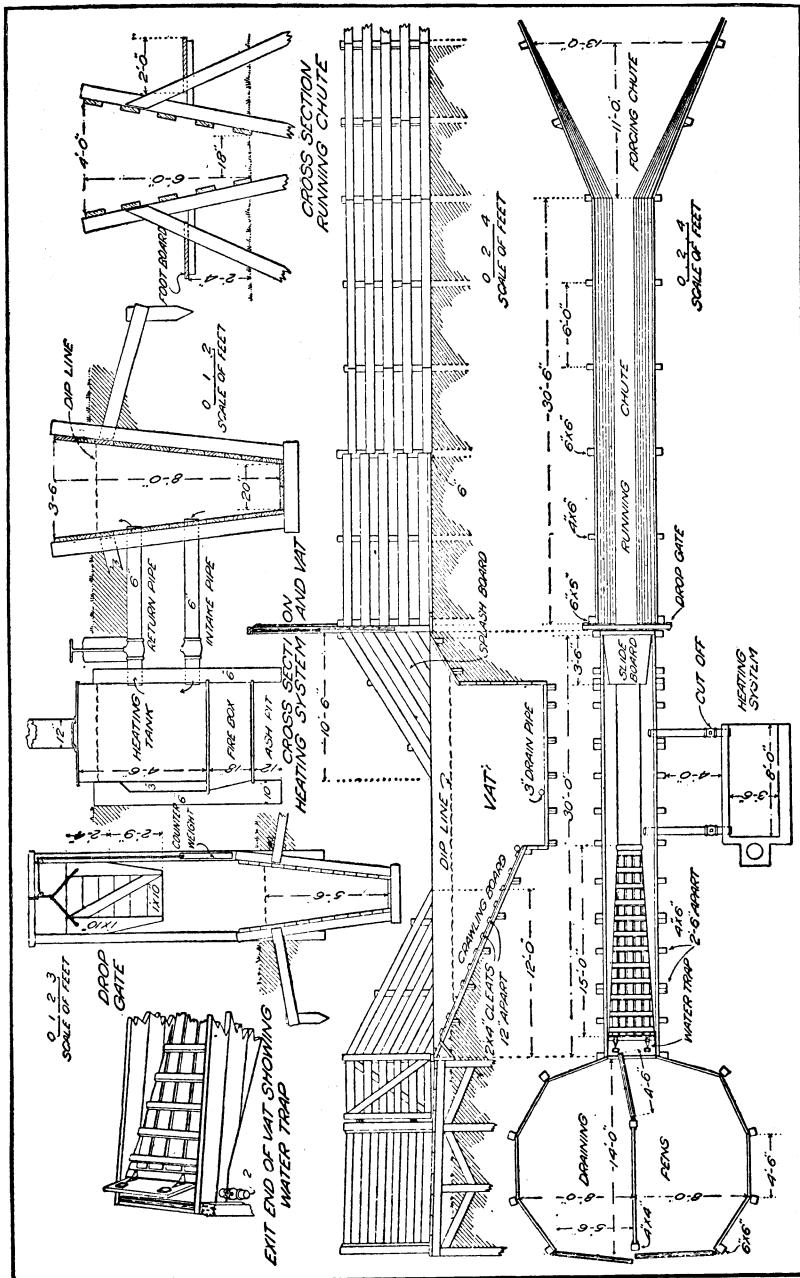


Figure 11.—Plan of cattle-dipping plant with wooden vat.

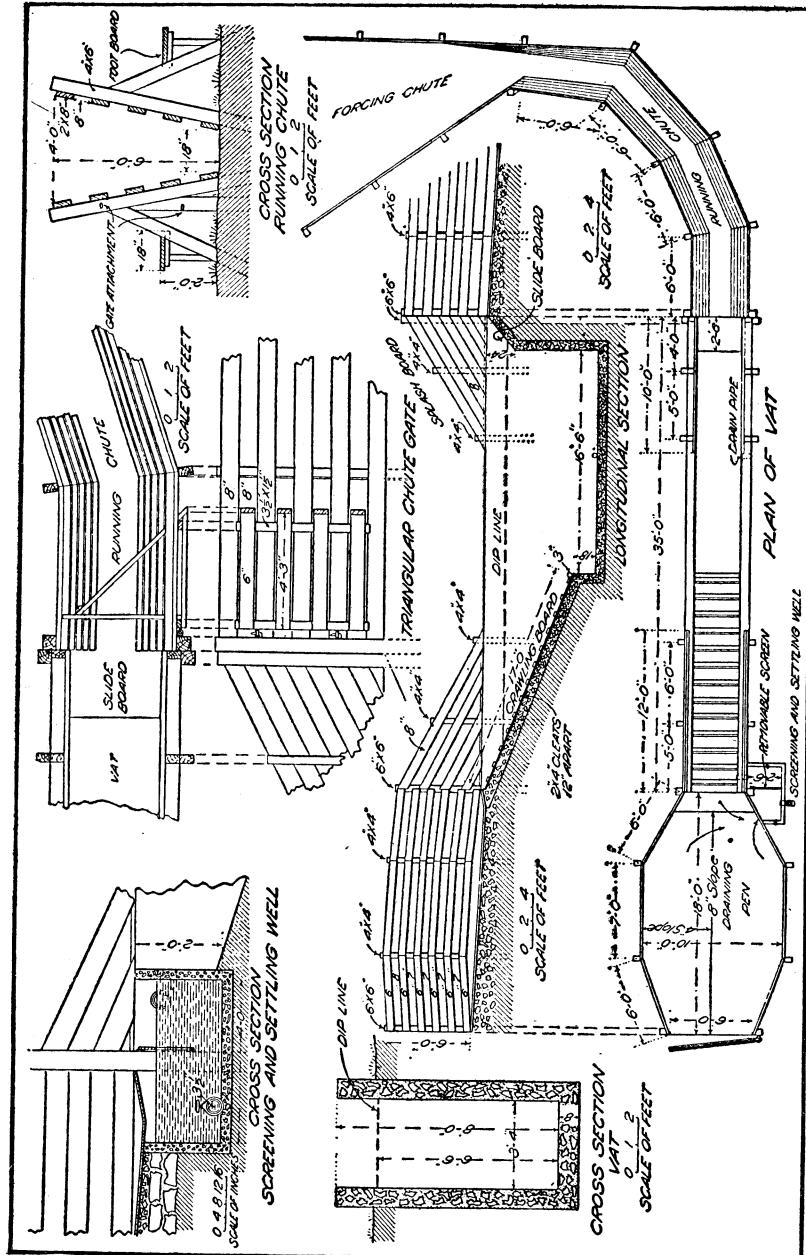


Figure 12.—Plan of cattle-dipping plant with concrete vat.

Either of these is suitable for dipping cattle or horses for any purpose. The chutes, draining pens, etc., shown in one set of plans may be substituted for those shown in the other.

If a dip is to be used that requires cooking and settling, such as home-made lime-sulfur, commonly employed in the treatment of scab, boiling and settling tanks (fig. 13) are necessary.

dipping plant should be located close to an adequate supply. The vat, however, should not be located on low, marshy land or where flood-waters overflow.

## Corrals and Chutes

The receiving corral and the holding corral should be large enough to hold the largest herd to be dipped. They should be con-

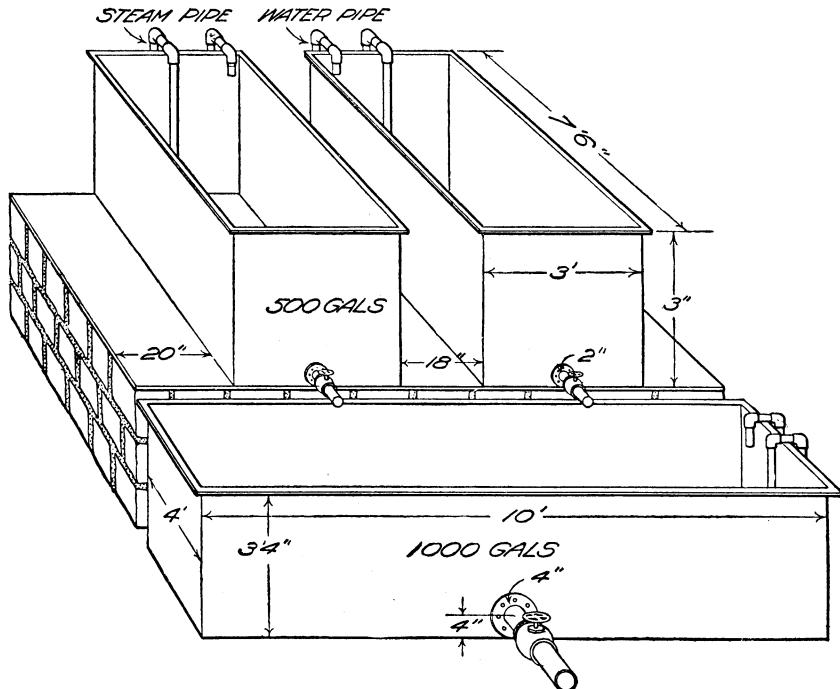


Figure 13.—Cooking and settling tanks for general-purpose cattle-dipping vats.

## Selecting a Location

In selecting a location for a dipping plant keep in mind the fact that animals work better up grade. The corrals and running chute should slope up to the entrance end of the vat. The vat should be on level ground, preferably extending north and south with the entrance at the south and the exit at the north. Animals work better when not facing the sun. A considerable quantity of water is used, so the

structure with the least possible number of corners into which the cattle may become crowded and injured.

The proper design and construction of the chutes is important. Improperly constructed chutes add greatly to the difficulty of getting cattle into the vat and cause rough handling of the animals. The running chute should be at least 30 feet long and preferably curved to obstruct the view of animals approaching the vat. Two styles of running

chutes and crowding chutes are shown in the plans, and dimensions and structural details are given. Two styles of chute gates are also shown. Most stockmen prefer the triangular gate. A drop gate as shown in figure 10 may be adapted for use either as a check gate in the chute or as a holding gate in the vat. A holding gate at the beginning of the exit incline is necessary only when animals are being dipped for scab, or when they are to be held in the dip longer than the time ordinarily required for passing through the vat.

### Draining Pens

When cattle emerge from the vat into the draining pen, they carry out some of the dip in their hair coat. Save this dip by allowing it to drain back into the vat. If objectionable mud holes and pools are formed, the animals may drink from them with injurious results. Draining pens should have watertight floors sloping toward the vat or draining wells to catch and return the dip to the vat. The size may be increased or decreased according to the length of the vat. The floors, made of lumber or cement, should have settling wells or water traps to prevent rain water from running into the vat and diluting the dip. A design of a settling well for a cement vat and a water trap for a wooden vat are shown in figures 11 and 12. The settling well may be used with the wooden vat, in which case the water trap would be unnecessary, as the settling well serves the same purpose.

In constructing the draining pens of cement, build the outer walls in the same manner as the foundations for a house, except that they are to be 8 inches thick. Fill the space inside the walls with gravel to the required height and lay the sloping floors on the tamped gravel. To prevent slipping, roughen the ce-

ment floors with a stiff broom while the concrete is soft, or use a coat of pebble dash.

If wooden floors are used they should be double with a layer of tar paper between. Rough lumber may be used for the lower floor, but the top one should be of matched boards 1 inch thick. Cleats should be nailed to the floor to prevent the cattle from slipping.

### Vats

The dipping vat may be of either cement or of lumber. When properly made the cement vat is more durable and in many other ways more satisfactory than a wooden vat. The sides may be perpendicular, as shown in the plans for a cement vat (fig. 12), or sloping, as shown in those for a wooden vat (fig. 11). Sloping sides are generally considered more desirable for either cement or wooden vats. Both styles, however, are shown in the drawings, because some stockmen prefer vats with perpendicular sides. The dimensions shown in the cross section of the wooden vat may be followed in constructing a cement vat with sloping sides.

The length of the vat may vary from 24 to 100 feet, depending on the number of cattle to be dipped. The top may extend 9 to 18 inches above the surface of the ground. A vat of this kind affords better conditions for handling cattle than one flush with the ground. If it is desired that the top be flush with the ground, the vat should be built so that it extends 5 inches above the natural surface of the ground and should be graded up with gravel or cinders to form a dry path along each side.

The slide board should be made of or covered with a smooth-surfaced material, such as planed lumber or sheet metal. A piece of boilerplate makes an excellent slide board. The dimensions of the slide

board shown in connection with the cement vat are those commonly used. A short, steep slide board causes the animals to plunge abruptly into the dip, while a long gradual slope allows them to slide in more gently. The short, steep slope has the advantage that the animals cannot brace themselves on it for a leap as easily as on the long, gradual slide.

The exit incline or crawling board in small vats should be about 16 feet long, so that it may not be too steep. In cement vats a false floor to which cross cleats are nailed is usually laid on the exit incline. Bolts should be embedded in the concrete for fastening the false floor. The plans for the concrete vat (fig. 12) show that the lower end of the floor is held in position by a cross pipe embedded in the concrete and the upper end and middle by bolts.

Permanent pipes for conducting water and dip to the vat should be so laid that they will not be in the way of men working along the vat. The path along both sides of the vat should be free of obstructions; and there should be no cross pieces over the top of the vat that might interfere with the proper handling of cattle in the dip.

The wooden vat shown in figure 11 has sloping sides, but, as already stated, they may be perpendicular. Softwood for the frame timbers should be 6 by 6 inches, but hardwood timbers 4 by 4 inches are sufficiently large for the purpose. Cedar posts make good framing timbers, as they do not rot rapidly. Matched planks 2 inches thick should be used in building the vat, and they should be beveled so that all joints and seams may be caulked with oakum and rosin or similar material.

Figure 11 shows a water trap with hinged cover in the exit incline of a wooden vat. While dipping is in progress both the cover and the valve to the drain pipe should be

closed. When dipping is finished for the day, both should be opened so that if rain falls in the draining pens, it will not run into the vat and dilute the dip.

Heating equipment is necessary for dips that are used warm. The one shown in the plans of the wooden vat (fig. 11) may also be built for a cement vat. When the open-tank heating system shown in figure 13 is used settling wells are not necessary, as the heating tank answers the purpose of a settling well. This system has an advantage over the old-style coil heater because the pipes may easily be kept from clogging. Usually a 25-horsepower boiler is installed and the steam is piped to the vat. The steam is discharged into the dip through perforated pipe laid along the bottom of the vat for about two-thirds its length. The water condensing from the steam passing into the vat from the boiler, dilutes the dip to a slight extent; make allowance for this dilution, therefore, in replenishing the dip.

The trench for the vat should be excavated so that the inside dimensions will correspond with the outside dimensions of the completed vat. If the sides of the trench are reasonably firm they may be used for the outer walls of the form, but whenever the vat extends above the surface of the ground it is necessary to build forms extending from the ground surface to the top of the vat. If the soil is sandy or the walls cave in outer forms will be needed, in which case the trench should be wide enough to allow for them.

The forms usually are made of 1-inch boards and 2- by 4-inch braces. As a supply of 2-inch lumber is necessary for the corrals and chutes, some of this lumber may first be used for the forms and afterward for constructing corrals and chutes. Two methods of bracing the forms are illustrated (figs. 14 and 15).

Bolts for fastening the crawling and slide boards and the drain and other pipes should be placed in position in the forms before the concrete is laid. The concrete side and end

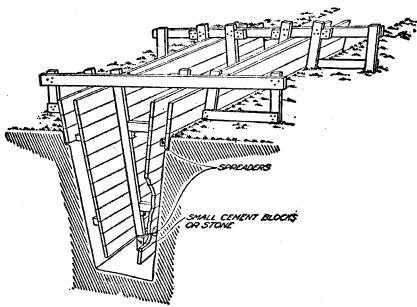


Figure 14.—Section of trench for concrete vat with sloping sides, showing the forms in place and one method of bracing. (Compare with fig. 15.)

walls should be reinforced with heavy woven wire, and the reinforcements placed properly in the forms so that they may be embedded in the middle of the walls.

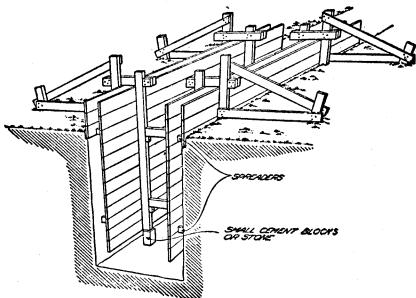


Figure 15.—Section of trench for concrete vat with perpendicular sides, showing the forms in place and a different method of bracing from that shown in figure 14.

The concrete for dipping vats should be made of 1 part of Portland cement by measure,  $2\frac{1}{2}$  parts of sand, and 4 parts of screened gravel or crushed stone. The sand should be coarse, clean, and free from foreign matter. The crushed stone or gravel may vary in size from one-fourth to 1 inch in

diameter. The mixing should be done on a smooth, tight platform and the sand and rock measured separately in a bottomless box 2 feet long, 2 feet wide, and 1 foot deep, having a capacity of 4 cubic feet. For  $2\frac{1}{2}$  cubic feet mark the inside of the box  $7\frac{1}{2}$  inches up from the bottom. Each sack of Portland cement is assumed to contain 1 cubic foot of cement. Mix the sand and cement thoroughly, add the crushed stone (previously drenched with water), and mix the whole mass by turning it several times with shovels. Then add water in a depression made in the center of the pile and mix well by turning several times with shovels, adding enough water during the mixing to make a quaky, or thin, jellylike mixture.

Place the concrete in the forms as soon as the mixing is finished. Lay the floor and exit end first and tamp the concrete well. In filling the forms settle the concrete into place by spading rather than by tamping; in spading next to the inside forms be sure to force back the coarse particles and allow the sand-cement mortar to form a dense, watertight surface. An old hoe straightened out makes a good spading tool, as the handle is long enough to reach the bottom of the forms. If it is necessary to stop work for the day before the forms are filled, roughen the surface of the concrete in the forms with a stick. Just before placing additional concrete wash the roughened surface and paint it with cement and water mixed to the consistency of thick cream. Leave the forms in place 2 or 3 days, if possible, and wet the concrete daily. After the forms are removed, dampen the surface of the concrete and apply a finishing coat composed of 1 part of cement and 2 parts of sand, or mix cement and water to the consistency of cream and apply it, brushing well to form a smooth surface.